

In the claims:

Claims 1 to 6 (canceled)

Claim 7 (currently amended) A method for forming metallurgical connections between metal wires and bond pads positioned on integrated circuits having copper interconnecting metallization, comprising the steps of:

depositing seed metal to activate the surface of said copper metallization of said bond pads;

plating a layer of barrier metal of sufficient thickness to resist ~~that resists~~ copper diffusion at 250° C by more than 80% compared with the absence of said barrier metal, by electroless deposition, ~~said barrier metal and the thickness thereof coordinated such that said layer reduces the diffusion of copper at 250 °C by more than 80% compared with the absence of said barrier metal;~~

plating a layer of bondable metal of sufficient thickness, by electroless deposition, ~~said bondable metal and the thickness thereof coordinated such that said layer reduces to~~ reduce the diffusion of said barrier metal at 250 °C by more than 80% compared with the absence of said bondable metal, ~~thereby forming to form~~ the outermost bondable metal layer of said bond pad; and

bonding one of said metal wires onto said outermost metal.

Claim 8 (previously presented) The method according to Claim 7 wherein said wire bonding step comprises ball bonding or wedge bonding.

Claim 9 (previously presented) The method according to Claim 7 wherein said bond pads are formed by a process comprising:

depositing a protective overcoat over the surface of said integrated circuit, including the surface portions having copper metallization; and

opening selected areas of said overcoat by photolithographic techniques, exposing the surface of said copper metallization.

Claim 10 (previously presented) The method according to Claim 9 further comprising a cleaning step after said opening step, by immersing said exposed copper surface in a solution of sulfuric acid, nitric acid, or any other acid.

Claim 11 (previously presented) The method according to Claim 7 wherein said step of activating comprises immersing the bond pads in a catalytic metal chloride solution.

Claim 12 (previously presented) The method according to Claim 11 wherein said metal chloride is palladium chloride.

Claim 13 (previously presented) The method according to Claim 7 wherein said electroless plating of said bondable metal layer is immersion plating.

Claim 14 (previously presented) The method according to Claim 7 wherein said electroless plating of said bondable metal layer is immersion plating followed by autocatalytic plating.

Claim 15 (previously presented) The method according to Claim 7 further comprising the step of electrically probing said outermost metal of said bond pad before the step of bonding, leaving substantially no probe marks.

Claim 16 (currently amended) A method for forming metallurgical connections between metal wires and bond pads positioned on integrated circuits having copper interconnecting metallization, comprising the steps of:

depositing seed metal to activate the surface of said copper metallization of said bond pads;

plating on said seed metal a barrier layer, by electroless deposition, said barrier layer having a thickness of at least about 0.5 μm , said barrier layer selected from a group consisting of nickel, cobalt, chromium, molybdenum, titanium, tungsten, and alloys thereof;

plating on said barrier layer a bondable layer, by electroless deposition, said bondable layer having a thickness of at least about 0.4 μm , said bondable layer selected from a group consisting of gold, palladium, platinum, and silver; and

bonding one of said metal wires onto said bondable layer.

Claim 17 (previously presented) The method of Claim 16, wherein said step of plating on said barrier layer a bondable layer comprises the steps of:

conducting a self-limiting surface metal replacement; and
conducting an autocatalytic deposition.

Claim 18 (previously presented) The method of Claim 16, wherein said step of plating on said seed metal a barrier layer comprises plating said barrier layer having a thickness in the range of about 0.5 μm to about 1.5 μm .

Claim 19 (previously presented) The method of Claim 16, wherein said step of plating on said barrier layer a bondable layer comprises plating said bondable layer having a thickness in the range of about 0.4 μm to about 1.5 μm .

Claim 20 (previously presented) The method of Claim 16, wherein said step of depositing seed metal is preceded by a step comprising:

depositing a protective overcoat over the surface of said integrated circuit, including the surface portions having copper metallization; and

opening selected areas of said overcoat, exposing the surface of said copper metallization.

Claim 21 (previously presented) The method of Claim 20, further comprising the step of immersing said exposed surface of said copper metallization in an acid solution.

Claim 22 (previously presented) A method for forming metallurgical connections between metal wires and bond pads positioned on integrated circuits having copper interconnecting metallization, comprising:

depositing palladium seed metal to activate the surface of said copper metallization of said bond pads;

plating on said seed metal a layer of nickel, by electroless deposition, said layer of nickel having a thickness of at least about 0.5 μm ;

plating on said layer of nickel a layer of gold, by electroless deposition, said layer of gold having a thickness of at least about 0.4 μm ; and

bonding one of said metal wires onto said layer of gold.

Claim 23 (previously presented) The method of Claim 22, wherein said step of plating on said nickel layer a layer of gold comprises the steps of:

conducting a self-limiting surface metal replacement; and

conducting an autocatalytic deposition.

Claim 24 (previously presented) The method of Claim 22, wherein said step of plating on said seed metal a layer of nickel comprises plating a nickel layer having a thickness in the range of about 0.5 μm to about 1.5 μm

Claim 25 (previously presented) The method of Claim 22, wherein said step of plating on said layer of nickel a layer of gold comprises plating a gold layer having a thickness in the range of about 0.4 μm to about 1.5 μm .

Claim 26 (previously presented) The method of claim 22, wherein said step of depositing seed metal is preceded by a step comprising:

depositing a protective overcoat over the surface of said integrated circuit, including the surface portions having copper metallization; and

opening selected areas of said overcoat, exposing the surface of said copper metallization.